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Vertically localized equilibrium solutions in the large eddy simulation of homogeneous shear flow[1] ATSUSHI SEKIMOTO, JAVIER JIMENEZ, Univ Politecnica de Madrid — Equilibrium solutions in a large eddy simulation (LES) of statistically-stationary homogeneous shear flow with zero molecular viscosity are numerically obtained by a Newton-Krylov-hookstep method. The energy input is done by the mean shear at scales comparable to the spanwise width L_z of the computational domain, while energy dissipation is represented by the eddy viscosity term at the small scale of the order of the Smagorinsky length $C_S\Delta$ (C_S is the static Smagorinsky constant and Δ is the grid scale). It is shown that these solutions appear by a saddle-node bifurcation as $C_S\Delta/L_z$ decreases, and have the sinuous symmetry of Nagata's equilibrium solution in Couette flow (JFM 217, 519-527 (1990)). Both lower- and upper-branch solutions are vertically localized. The upper-branch solution is characterized by tall structures, while the lower-branch forms in the critical layer as in the asymptotic theory of shear flows at high-Reynolds numbers (K. Deguchi & P. Hall, Phil. Trans. R. Soc A, 372:20130352 (2014)).

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